

Amendments to the Claims

The listing of claims will replace all prior version, and listings of claims in the application.

Listing of Claims:

Claim 1 (Currently Amended) A method for forming a semiconductor structure, said method comprising:

providing a crystalline silicon (111) substrate ~~having a buffer layer thereon, wherein said buffer layer comprising at least two layers of distinct material with sharp material transitions and epitaxial alignments between the layers and between the bottom layer of said buffer layer and said crystalline silicon substrate; [[and]]~~

forming a single-crystal silicon nitride layer on said crystalline silicon (111) substrate with sharp material transitions and epitaxial alignments between said single-crystal silicon nitride layer and said crystalline silicon substrate;

forming a single-crystal group-III nitride layer on said crystalline silicon (111) substrate with sharp material transitions and epitaxial alignments between said single-crystal group-III nitride layer and said single-crystal silicon nitride layer; and

forming a group-III nitride semiconductor structure on said ~~buffer~~ single-crystal group-III layer. --

Claims 2 - 6 (Cancelled).

Claim 7 (Currently Amended) The method according to claim 6, wherein said forming said single-crystal silicon nitride layer comprises performing a nitrogen-plasma nitridation to said crystalline silicon (111) substrate.

Claim 8 (Currently Amended) The method according to claim 6, wherein said forming said single-crystal silicon nitride layer comprises performing a thermal nitridation to said crystalline silicon (111) substrate.

Claim 9 (Currently Amended) The method according to claim 6, wherein said forming said single-crystal silicon nitride layer comprises performing a chemical vapor deposition to said crystalline silicon (111) substrate.

Claim 10 (Currently Amended) The method according to claim [[6]] 1, wherein said forming said single-crystal group-III nitride layer comprises:

performing an aluminum pre-deposition process to said single-crystal silicon nitride layer terminated by nitrogen surface adatoms without introducing reactive nitrogen species to form an aluminum pre-deposition atomic layer on said single silicon nitride layer;

performing a thermal annealing process to said aluminum pre-deposition atomic layer to form a single-crystal aluminum nitride monolayer on said single-crystal silicon nitride layer; and

performing an aluminum nitride epitaxial growth process to said single-crystal aluminum nitride monolayer to form said group-III nitride layer on said single-crystal aluminum nitride monolayer. --

Claim 11 (Original) The method according to claim 1, wherein said group-III nitride semiconductor structure is formed by chemical vapor deposition method.

Claim 12 (Original) The method according to claim 1, wherein said group-III nitride semiconductor structure is formed by molecular beam epitaxy method.

Claim 13 (Original) The method according to claim 1, wherein said group-III nitride semiconductor structure is a group-III nitride single layer.

Claim 14 (Original) The method according to claim 1, wherein said group-III nitride semiconductor structure is a group-III nitride multiple-layer structure.

Claim 15 (Currently Amended)

The method according to claim 1, wherein said group-III nitride semiconductor structure is an indium ~~gallium~~ nitride epitaxial layer.

Claim 16 (Original) A method for growing a group-III nitride semiconductor heteroepitaxial structure, said method comprising:

providing a silicon (111) substrate;

performing a nitrogen-plasma nitridation process to said silicon (111) substrate to form a single-crystal silicon nitride layer on said silicon (111) substrate;

performing an aluminum pre-deposition process to said single-crystal silicon nitride layer terminated by nitrogen surface adatoms without introducing reactive nitrogen species to form an aluminum pre-deposition atomic layer on said single-crystal silicon nitride layer; --

performing a thermal annealing process to said aluminum pre-deposition atomic layer to form a single-crystal aluminum nitride monolayer on said single-crystal silicon nitride layer;

performing an aluminum nitride epitaxial growth process to said single-crystal aluminum nitride monolayer to form an aluminum nitride epitaxial buffer layer on said single-crystal silicon nitride layer; and

forming a group-III nitride semiconductor heteroepitaxial structure by epitaxial process on said aluminum nitride epitaxial buffer layer.

Claim 17 (Original) The method according to claim 16, further comprising performing a thermal annealing in ultrahigh vacuum to said silicon (111) substrate to form a reconstructed silicon (111) surface.

Claim 18 (Original) The method according to claim 16, further comprising performing an active hydrogen plasma cleaning process to said silicon (111) substrate to form a clean and smooth silicon (111) substrate.

Claim 19 (Original) The method according to claim 16, further comprising performing an ex-situ wet etching process to said silicon (111) substrate to form a clean and smooth silicon (111) surface.

Claim 20 (Original) The method according to claim 16, wherein said performing a nitrogen-plasma nitridation process to said silicon (111) substrate to form a said single-crystal silicon nitride layer on said silicon (111) substrate is a thermal nitridation process.

Claims 21-34 (Cancelled).

Claim 35 (New) A method for forming a semiconductor structure, said method comprising:

providing a crystalline silicon (111) substrate;

forming a single-crystal silicon nitride layer on said crystalline silicon (111) substrate;

performing an aluminum pre-deposition process to said single-crystal silicon nitride layer terminated by nitrogen surface adatoms without introducing reactive nitrogen species to form an aluminum pre-deposition atomic layer on said single silicon nitride layer;

performing a thermal annealing process to said aluminum pre-deposition

atomic layer to form a single-crystal aluminum nitride monolayer on said single-crystal silicon nitride layer; and

performing an aluminum nitride epitaxial growth process to said single-crystal aluminum nitride monolayer to form a group-III nitride layer on said single-crystal aluminum nitride monolayer.

Claim 36 (New) The method according to claim 35, wherein said forming said single-crystal silicon nitride layer comprises performing a nitrogen-plasma nitridation to said crystalline silicon (111) substrate.

Claim 37 (New) The method according to claim 35, wherein said forming said single-crystal silicon nitride layer comprises performing a thermal nitridation to said crystalline silicon (111) substrate.

Claim 38 (New) The method according to claim 35, wherein said forming said single-crystal silicon nitride layer comprises performing a chemical vapor deposition to said crystalline silicon (111) substrate.